AMENDMENTS TO THE CLAIMS

1-2. (Cancelled)

3. (Currently Amended) ~~The~~ A transmitter for transmitting modulation symbols in a wireless communication system, comprising:

a plurality of transmit antennas for achieving transmit diversity;

a space time encoder for generating a transmission coding matrix with four rows corresponding to transmission time periods and four columns corresponding to the transmit antennas when the number of the transmit antennas is 4, encoding a plurality of input symbols into a plurality of symbol combinations to transmit the input symbols once from each transmit antenna at each time period by using the transmission coding matrix, and outputting the symbol combinations to the transmit antennas during the transmission time periods, the symbol combinations having orthogonal symbols, inversions and conjugates of the input symbols; and

a phase rotator part for selectively rotating the phases of some of the symbols in the at least two columns of the transmission coding matrix by a predetermined phase value~~of claim 2~~,

wherein the transmission coding matrix is one of

$$\begin{bmatrix} s_1 & s_2 & s_3^* & s_4^* \\ s_2^* & -s_1^* & s_4 & -s_3 \\ s_3 & s_4 & -s_1^* & -s_2^* \\ s_4^* & -s_3^* & -s_2 & s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & s_3^* & -s_4^* \\ s_2^* & -s_1^* & s_4 & s_3 \\ s_3 & s_4 & -s_1^* & s_2^* \\ s_4^* & -s_3^* & -s_2 & -s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & s_3^* & -s_4^* \\ s_2^* & -s_1^* & -s_4 & -s_3 \\ s_3 & s_4 & -s_1^* & s_2^* \\ s_4^* & -s_3^* & s_2 & s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & s_3^* & s_4^* \\ s_2^* & -s_1^* & -s_4 & s_3 \\ s_3 & s_4 & -s_1^* & -s_2^* \\ s_4^* & -s_3^* & s_2 & -s_1 \end{bmatrix}$$

$$\begin{bmatrix} s_1 & s_2 & -s_3^* & -s_4^* \\ s_2^* & -s_1^* & s_4 & -s_3 \\ s_3 & s_4 & s_1^* & s_2^* \\ s_4^* & -s_3^* & -s_2 & s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & -s_3^* & s_4^* \\ s_2^* & -s_1^* & s_4 & s_3 \\ s_3 & s_4 & s_1^* & -s_2^* \\ s_4^* & -s_3^* & -s_2 & -s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & -s_3^* & -s_4^* \\ s_2^* & -s_1^* & -s_4 & s_3 \\ s_3 & s_4 & s_1^* & s_2^* \\ s_4^* & -s_3^* & s_2 & -s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & -s_3^* & s_4^* \\ s_2^* & -s_1^* & -s_4 & -s_3 \\ s_3 & s_4 & s_1^* & -s_2^* \\ s_4^* & -s_3^* & s_2 & s_1 \end{bmatrix}$$

where s_1, s_2, s_3 and s_4 ~~are the~~ represent four input symbols.

4. (Currently Amended) ~~The~~ A transmitter for transmitting modulation symbols in a wireless communication system, comprising:~~of claim 2~~

a plurality of transmit antennas for achieving transmit diversity;

a space time encoder for generating a transmission coding matrix with four rows corresponding to transmission time periods and four columns corresponding to the transmit

antennas when the number of the transmit antennas is 4, encoding a plurality of input symbols into a plurality of symbol combinations to transmit the input symbols once from each transmit antenna at each time period by using the transmission coding matrix, and outputting the symbol combinations to the transmit antennas during the transmission time periods, the symbol combinations having orthogonal symbols, inversions and conjugates of the input symbols; and

a phase rotator part for selectively rotating the phases of some of the symbols in the at least two columns of the transmission coding matrix by a predetermined phase value,

wherein if the input symbols are BPSK (Binary Phase Shift Keying) symbols, the transmission coding matrix is

$$U_2=\begin{pmatrix} s_1 & s_2 & js_3 & s_4 \\ -s_2^* & s_1^* & -js_4^* & s_3^* \\ -s_4^* & -s_3^* & js_2^* & s_1^* \\ s_3 & -s_4 & -js_1 & s_2 \end{pmatrix}$$

where s_1, s_2, s_3 and s_4 represent ~~are the~~ four input symbols.

5. (Currently Amended) ~~The~~ A transmitter for transmitting modulation symbols in a wireless communication system, comprising:~~of claim 2~~

a plurality of transmit antennas for achieving transmit diversity;

a space time encoder for generating a transmission coding matrix with four rows corresponding to transmission time periods and four columns corresponding to the transmit antennas when the number of the transmit antennas is 4, encoding a plurality of input symbols into a plurality of symbol combinations to transmit the input symbols once from each transmit antenna at each time period by using the transmission coding matrix, and outputting the symbol combinations to the transmit antennas during the transmission time periods, the symbol combinations having orthogonal symbols, inversions and conjugates of the input symbols; and

a phase rotator part for selectively rotating the phases of some of the symbols in the at least two columns of the transmission coding matrix by a predetermined phase value,

wherein if the input symbols are QPSK (Quadrature Phase Shift Keying) symbols, the transmission coding matrix is

$$U_4 = \begin{pmatrix} s_1 & s_2 & s_3 & s_4 \\ -s_2^* & s_1^* & -vs_4^* & vs_3^* \\ -s_4^* & -s_3^* & s_2^* & s_1^* \\ s_3 & -s_4 & -vs_1 & vs_2 \end{pmatrix}$$

where s_1, s_2, s_3 and s_4 represent ~~are the~~ four input symbols and v is the predetermined phase value.

6. (Original) The transmitter of claim 5, wherein v is $e^{-j2\pi/3}$.

7. (Currently Amended) ~~The~~ A transmitter ~~of claim 2~~ for transmitting modulation symbols in a wireless communication system, comprising:

a plurality of transmit antennas for achieving transmit diversity;

a space time encoder for generating a transmission coding matrix with four rows corresponding to transmission time periods and four columns corresponding to the transmit antennas when the number of the transmit antennas is 4, encoding a plurality of input symbols into a plurality of symbol combinations to transmit the input symbols once from each transmit antenna at each time period by using the transmission coding matrix, and outputting the symbol combinations to the transmit antennas during the transmission time periods, the symbol combinations having orthogonal symbols, inversions and conjugates of the input symbols; and

a phase rotator part for selectively rotating the phases of some of the symbols in the at least two columns of the transmission coding matrix by a predetermined phase value.

wherein if the input symbols are 8PSK (8-ary Phase Shift Keying) symbols, the transmission coding matrix is

$$U_6 = \begin{pmatrix} s_1 & s_2 & s_3 & s_4 \\ -s_2^* & s_1^* & -vs_4^* & vs_3^* \\ -s_4^* & -s_3^* & s_2^* & s_1^* \\ s_3 & -s_4 & -vs_1 & vs_2 \end{pmatrix}$$

where s_1, s_2, s_3 and s_4 represent ~~are the~~ four input symbols and v is the predetermined phase value.

8. (Original) The transmitter of claim 7, wherein v is $e^{-j5\pi/6}$.

9. (Currently Amended) ~~The~~ A transmitter for transmitting modulation symbols in a wireless communication system, comprising: ~~of claim 2~~

a plurality of transmit antennas for achieving transmit diversity;

a space time encoder for generating a transmission coding matrix with four rows corresponding to transmission time periods and four columns corresponding to the transmit antennas when the number of the transmit antennas is 4, encoding a plurality of input symbols into a plurality of symbol combinations to transmit the input symbols once from each transmit antenna at each time period by using the transmission coding matrix, and outputting the symbol combinations to the transmit antennas during the transmission time periods, the symbol combinations having orthogonal symbols, inversions and conjugates of the input symbols, and

a phase rotator part for selectively rotating the phases of some of the symbols in the at least two columns of the transmission coding matrix by a predetermined phase value,

wherein if the input symbols are 16QAM (16-ary Quadrature Amplitude Modulation) symbols, the transmission coding matrix is

$$U_8 = \begin{pmatrix} s_1 & s_2 & s_3 & s_4 \\ -s_2^* & s_1^* & -vs_4^* & vs_3^* \\ -s_4^* & -s_3^* & s_2^* & s_1^* \\ s_3 & -s_4 & -vs_1 & vs_2 \end{pmatrix}$$

where s_1, s_2, s_3 and s_4 represent ~~are the~~ four input symbols and v is the predetermined phase value.

10. (Original) The transmitter of claim 9, wherein v is $e^{-j5\pi/12}$.

11. (Currently Amended) ~~The~~ A transmitter ~~of claim 2~~ for transmitting modulation symbols in a wireless communication system, comprising:

a plurality of transmit antennas for achieving transmit diversity;

a space time encoder for generating a transmission coding matrix with four rows corresponding to transmission time periods and four columns corresponding to the transmit antennas when the number of the transmit antennas is 4, encoding a plurality of input symbols into a plurality of symbol combinations to transmit the input symbols once from each transmit antenna at each time period by using the transmission coding matrix, and outputting the symbol combinations to the transmit antennas during the transmission time periods, the symbol combinations having orthogonal symbols, inversions and conjugates of the input symbols; and

a phase rotator part for selectively rotating the phases of some of the symbols in the at least two columns of the transmission coding matrix by a predetermined phase value,

wherein if the input symbols are 64QAM (64-ary Quadrature Amplitude Modulation) symbols, the transmission coding matrix is

$$U_{10}=\begin{pmatrix} s_1 & s_2 & s_3 & s_4 \\ -s_2^* & s_1^* & -vs_4^* & vs_3^* \\ -s_4^* & -s_3^* & s_2^* & s_1^* \\ s_3 & -s_4 & -vs_1 & vs_2 \end{pmatrix}$$

where s_1, s_2, s_3 and s_4 represent ~~are the~~ four input symbols and v is the predetermined phase value.

12. (Original) The transmitter of claim 11, wherein v is $e^{-j7\pi/48}$.

13. (Currently Amended) ~~The~~ A transmitter ~~of claim 1~~ for transmitting modulation symbols in a wireless communication system, comprising:

three transmit antennas for achieving transmit diversity;

a space time encoder for generating a transmission coding matrix with four rows corresponding to transmission time periods and three columns corresponding to the transmit antennas, encoding a plurality of input symbols into a plurality of symbol combinations to transmit the input symbols once from each transmit antenna at each time period by using the

transmission coding matrix, and outputting the symbol combinations to the transmit antennas during the transmission time periods, the symbol combinations having orthogonal symbols, inversions and conjugates of the input symbols; and

~~wherein if the number of the transmit antennas is 3, the space-time encoder generates the transmission coding matrix with four rows and four columns from four input symbols, and the inversions and the conjugates of the four symbols, and~~

~~the~~ a phase rotator part for selectively ~~rotates~~ rotating the phases of some of the symbols in the at least two columns of the transmission coding matrix by a predetermined phase value,

wherein the transmitter further comprises a column generator for generating a new column by summing the symbols of the selected two columns containing phase-rotated symbols and replacing the selected two columns with the new column, thereby generating the transmission coding matrix with four rows and three columns.

14. (Currently Amended) The transmitter of claim 13, wherein the transmission coding matrix generated from the encoder is one of

$$\begin{bmatrix} s_1 & s_2 & s_3^* & s_4^* \\ s_2^* & -s_1^* & s_4 & -s_3 \\ s_3 & s_4 & -s_1^* & -s_2^* \\ s_4^* & -s_3^* & -s_2 & s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & s_3^* & -s_4^* \\ s_2^* & -s_1^* & s_4 & s_3 \\ s_3 & s_4 & -s_1^* & s_2^* \\ s_4^* & -s_3^* & -s_2 & -s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & s_3^* & -s_4^* \\ s_2^* & -s_1^* & -s_4 & -s_3 \\ s_3 & s_4 & -s_1^* & s_2^* \\ s_4^* & -s_3^* & s_2 & s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & s_3^* & s_4^* \\ s_2^* & -s_1^* & s_4 & s_3 \\ s_3 & s_4 & -s_1^* & -s_2^* \\ s_4^* & -s_3^* & s_2 & -s_1 \end{bmatrix}$$

$$\begin{bmatrix} s_1 & s_2 & -s_3^* & -s_4^* \\ s_2^* & -s_1^* & s_4 & -s_3 \\ s_3 & s_4 & s_1^* & s_2^* \\ s_4^* & -s_3^* & -s_2 & s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & -s_3^* & s_4^* \\ s_2^* & -s_1^* & s_4 & s_3 \\ s_3 & s_4 & s_1^* & -s_2^* \\ s_4^* & -s_3^* & -s_2 & -s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & -s_3^* & -s_4^* \\ s_2^* & -s_1^* & -s_4 & s_3 \\ s_3 & s_4 & s_1^* & s_2^* \\ s_4^* & -s_3^* & s_2 & -s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & -s_3^* & s_4^* \\ s_2^* & -s_1^* & -s_4 & -s_3 \\ s_3 & s_4 & s_1^* & -s_2^* \\ s_4^* & -s_3^* & s_2 & s_1 \end{bmatrix}$$

$$\begin{bmatrix} (s_1+s_2)/\sqrt{2} & s_1^* & s_4^* \\ (s_2^*-s_1^*)/\sqrt{2} & s_4 & -s_3 \\ (s_3+s_4)/\sqrt{2} & -s_1^* & -s_2^* \\ (s_4^*-s_3^*)/\sqrt{2} & -s_2 & s_1 \end{bmatrix} \begin{bmatrix} s_1 & (s_2+s_3^*)/\sqrt{2} & s_4^* \\ s_2^* & (-s_1^*+s_4)/\sqrt{2} & -s_3 \\ s_3 & (s_4-s_1^*)/\sqrt{2} & -s_2^* \\ s_4^* & (-s_3^*-s_2)/\sqrt{2} & s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & (s_3^*+s_4^*)/\sqrt{2} \\ s_2^* & -s_1^* & (s_4-s_1)/\sqrt{2} \\ s_3 & s_4 & (-s_1^*-s_2^*)/\sqrt{2} \\ s_4^* & -s_3^* & (s_1-s_2)/\sqrt{2} \end{bmatrix}$$

$$\begin{bmatrix} (s_1+s_3^*)/\sqrt{2} & s_2 & s_4^* \\ (s_2^*-s_4)/\sqrt{2} & -s_1^* & -s_3 \\ (s_3-s_1^*)/\sqrt{2} & s_4 & -s_2^* \\ (s_4^*-s_2)/\sqrt{2} & -s_3^* & s_1 \end{bmatrix} \begin{bmatrix} s_1 & (s_2+s_4^*)/\sqrt{2} & s_3^* \\ s_2^* & (-s_1^*-s_3)/\sqrt{2} & s_4 \\ s_3 & (s_4-s_2^*)/\sqrt{2} & -s_1^* \\ s_4^* & (-s_3^*+s_1)/\sqrt{2} & s_2 \end{bmatrix} \begin{bmatrix} s_2 & s_3 & (s_1+s_4^*)/\sqrt{2} \\ -s_1^* & s_4 & (s_2^*-s_3)/\sqrt{2} \\ s_4 & -s_1^* & (s_3-s_2^*)/\sqrt{2} \\ -s_3^* & -s_2 & (s_4^*+s_1)/\sqrt{2} \end{bmatrix}$$

where s_1, s_2, s_3 and s_4 represent ~~are the~~ four input symbols.

15. (Original) The transmitter of claim 13, wherein if the input symbols are BPSK symbols, the transmission coding matrix is

$$U_1 = \begin{pmatrix} s_1 & \frac{s_2+js_3}{\sqrt{2}} & s_4 \\ -s_2^* & \frac{s_1^*-js_4^*}{\sqrt{2}} & s_3^* \\ -s_4^* & \frac{-s_3^*+js_2^*}{\sqrt{2}} & s_1^* \\ s_3 & \frac{-s_4-js_1}{\sqrt{2}} & s_2 \end{pmatrix}$$

where s_1, s_2, s_3 and s_4 represent ~~are the~~ four input symbols.

16. (Original) The transmitter of claim 13, wherein if the input symbols are QPSK symbols, the transmission coding matrix is

$$U_3=\begin{pmatrix} s_1 & \frac{s_2+s_3}{\sqrt{2}} & s_4 \\ -s_2^* & \frac{s_1^*-vs_4^*}{\sqrt{2}} & vs_3^* \\ -s_4^* & \frac{-s_3^*+s_2^*}{\sqrt{2}} & s_1^* \\ s_3 & \frac{-s_4-vs_1}{\sqrt{2}} & vs_2 \end{pmatrix}$$

where s_1, s_2, s_3 and s_4 represent ~~are the~~ four input symbols and v is the predetermined phase value.

17. (Original) The transmitter of claim 16, wherein v is $e^{-j2\pi/3}$.

18. (Original) The transmitter of claim 13, wherein if the input symbols are 8PSK symbols, the transmission coding matrix is

$$U_5=\begin{pmatrix} s_1 & \frac{s_2+s_3}{\sqrt{2}} & s_4 \\ -s_2^* & \frac{s_1^*-vs_4^*}{\sqrt{2}} & vs_3^* \\ -s_4^* & \frac{-s_3^*+s_2^*}{\sqrt{2}} & s_1^* \\ s_3 & \frac{-s_4-vs_1}{\sqrt{2}} & vs_2 \end{pmatrix}$$

where s_1, s_2, s_3 and s_4 represent ~~are the~~ four input symbols and v is the predetermined phase value.

19. (Original) The transmitter of claim 18, wherein v is $e^{-j5\pi/6}$.

20. (Original) The transmitter of claim 13, wherein if the input symbols are 16QAM symbols, the transmission coding matrix is

$$U_7=\begin{pmatrix} s_1 & \frac{s_2+s_3}{\sqrt{2}} & s_4 \\ -s_2^* & \frac{s_1^*-vs_4^*}{\sqrt{2}} & vs_3^* \\ -s_4^* & \frac{-s_3^*+s_2^*}{\sqrt{2}} & s_1^* \\ s_3 & \frac{-s_4-vs_1}{\sqrt{2}} & vs_2 \end{pmatrix}$$

where s_1, s_2, s_3 and s_4 represent ~~are the~~ four input symbols and v is the predetermined phase value.

21. (Original) The transmitter of claim 20, wherein v is $e^{-j5\pi/12}$.

22. (Original) The transmitter of claim 13, wherein if the input symbols are 64QAM symbols, the transmission coding matrix is

$$U_9=\begin{pmatrix} s_1 & \frac{s_2+s_3}{\sqrt{2}} & s_4 \\ -s_2^* & \frac{s_1^*-vs_4^*}{\sqrt{2}} & vs_3^* \\ -s_4^* & \frac{-s_3^*+s_2^*}{\sqrt{2}} & s_1^* \\ s_3 & \frac{-s_4-vs_1}{\sqrt{2}} & vs_2 \end{pmatrix}$$

where s_1, s_2, s_3 and s_4 represent ~~are the~~ four input symbols and v is the predetermined phase value.

23. (Original) The transmitter of claim 22, wherein v is $e^{-j7\pi/48}$.

24-36. (Cancelled)

37. (Currently Amended) A method for transmitting modulation symbols in a wireless communication system, the method comprising steps of:

generating a transmission coding matrix with four rows corresponding to transmission time periods and four columns corresponding to four transmit antennas for achieving transmit diversity;

encoding a plurality of input symbols into a plurality of symbol combinations to transmit the input symbols once from each transmit antenna at each time period by using ~~a~~ the transmission coding matrix~~with rows corresponding to transmission time periods and columns corresponding to the transmit antennas.~~;

outputting the symbol combinations to the each transmit antenna during the transmission time periods, the symbol combinations having orthogonal symbols, inversions and conjugates of the input symbols;~~,~~ and

selectively rotating the phases of some of the symbols in the at least two columns of~~symbol combinations by using~~ the transmission coding matrix by a predetermined phase value,

wherein the transmission coding matrix is one of

$$\begin{bmatrix} s_1 & s_2 & s_3^* & s_4^* \\ s_2^* & -s_1^* & s_4 & -s_3 \\ s_3 & s_4 & -s_1^* & -s_2^* \\ s_4^* & -s_3^* & -s_2 & s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & s_3^* & -s_4^* \\ s_2^* & -s_1^* & s_4 & s_3 \\ s_3 & s_4 & -s_1^* & s_2^* \\ s_4^* & -s_3^* & -s_2 & -s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & s_3^* & -s_4^* \\ s_2^* & -s_1^* & -s_4 & -s_3 \\ s_3 & s_4 & -s_1^* & s_2^* \\ s_4^* & -s_3^* & s_2 & s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & s_3^* & s_4^* \\ s_2^* & -s_1^* & -s_4 & s_3 \\ s_3 & s_4 & -s_1^* & -s_2^* \\ s_4^* & -s_3^* & s_2 & -s_1 \end{bmatrix}$$

$$\begin{bmatrix} s_1 & s_2 & -s_3^* & -s_4^* \\ s_2^* & -s_1^* & s_4 & -s_3 \\ s_3 & s_4 & s_1^* & s_2^* \\ s_4^* & -s_3^* & -s_2 & s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & -s_3^* & s_4^* \\ s_2^* & -s_1^* & s_4 & s_3 \\ s_3 & s_4 & s_1^* & -s_2^* \\ s_4^* & -s_3^* & -s_2 & -s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & -s_3^* & -s_4^* \\ s_2^* & -s_1^* & -s_4 & s_3 \\ s_3 & s_4 & s_1^* & s_2^* \\ s_4^* & -s_3^* & s_2 & -s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & -s_3^* & s_4^* \\ s_2^* & -s_1^* & -s_4 & -s_3 \\ s_3 & s_4 & s_1^* & -s_2^* \\ s_4^* & -s_3^* & s_2 & s_1 \end{bmatrix}$$

where s_1, s_2, s_3 and s_4 represent four input symbols.

38. (New) A method for transmitting modulation symbols in a wireless communication system. the method comprising steps of:

generating a transmission coding matrix with four rows corresponding to transmission time periods and three columns corresponding to three transmit antennas for achieving transmit diversity:

encoding a plurality of input symbols into a plurality of symbol combinations to transmit the input symbols once from each transmit antenna at each time period by using the transmission coding matrix;

outputting the symbol combinations to the each transmit antenna during the transmission time periods, the symbol combinations having orthogonal symbols, inversions and conjugates of the input symbols, and

selectively rotating the phases of some of the symbols in the at least two columns of the transmission coding matrix by a predetermined phase value,

wherein the transmission coding matrix is one of

$$\begin{bmatrix} (s_1+s_2)/\sqrt{2} & s_3^* & s_4^* \\ (s_2^*-s_1^*)/\sqrt{2} & s_4 & -s_3 \\ (s_3+s_4)/\sqrt{2} & -s_1^* & -s_2^* \\ (s_4^*-s_3^*)/\sqrt{2} & -s_2 & s_1 \end{bmatrix} \begin{bmatrix} s_1 & (s_2+s_3^*)/\sqrt{2} & s_4^* \\ s_2^* & (-s_1^*+s_4)/\sqrt{2} & -s_3 \\ s_3 & (s_4-s_1^*)/\sqrt{2} & -s_2^* \\ s_4^* & (-s_3^*-s_2)/\sqrt{2} & s_1 \end{bmatrix} \begin{bmatrix} s_1 & s_2 & (s_3^*+s_4^*)/\sqrt{2} \\ s_2^* & -s_1^* & (s_4-s_3)/\sqrt{2} \\ s_3 & s_4 & (-s_1^*-s_2^*)/\sqrt{2} \\ s_4^* & -s_3^* & (s_1-s_2)/\sqrt{2} \end{bmatrix}$$

$$\begin{bmatrix} (s_1+s_3^*)/\sqrt{2} & s_2 & s_4^* \\ (s_2^*-s_4)/\sqrt{2} & -s_1^* & -s_3 \\ (s_3-s_1^*)/\sqrt{2} & s_4 & -s_2^* \\ (s_1^*-s_2)/\sqrt{2} & -s_3^* & s_1 \end{bmatrix} \begin{bmatrix} s_1 & (s_2+s_4^*)/\sqrt{2} & s_3^* \\ s_2^* & (-s_1^*-s_3)/\sqrt{2} & s_4 \\ s_3 & (s_4-s_2^*)/\sqrt{2} & -s_1^* \\ s_4^* & (-s_3^*+s_1)/\sqrt{2} & s_2 \end{bmatrix} \begin{bmatrix} s_2 & s_3 & (s_1+s_4^*)/\sqrt{2} \\ -s_1^* & s_4 & (s_2^*-s_3)/\sqrt{2} \\ s_4 & -s_1^* & (s_3-s_2^*)/\sqrt{2} \\ -s_3^* & -s_2 & (s_4^*+s_1)/\sqrt{2} \end{bmatrix}$$

where s_1, s_2, s_3 and s_4 represent four input symbols.